

REMARKS

This paper is filed in response to the final office action mailed on February 14, 2003. The final office action rejects claims 1-13. Claims 2 and 4 have been canceled; claims 1 and 6 have been amended; claim 24 has been added; claims 1, 3, 5-13 and 24 are pending.

The office action rejects claims 1-3 and 6-8 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,916,855 ("Avanzino"). In response, claim 1 has been amended to traverse the anticipation rejection. However, claim 24 has been added which is a duplicate of claim 1 as presented in the last amendment and applicants respectfully submit that both independent claims 1 and 24 are allowable over Avanzino for the following reasons.

With respect to both claims 1 and 24, each claim recites a slurry used in a CMP process for a ruthenium thin film or a ruthenium alloy thin film. Applicants respectfully submit that this limitation appearing in the preamble gives "life and meaning" to independent claims 1 and 24 and defines the claimed slurry. In re Wertheim, 191 U.S.P.Q. 90, 102 (C.C.P.A. 1976). The Federal Circuit has held that the preamble limits the scope of a claim when patentability depends upon limitations stated in the preamble, In re Stencil, 4 U.S.P.Q.2d 1071, 1073 (Fed. Cir. 1987), or when the preamble contributes to the definition of the claimed invention, as set forth in Bell Communications Research, Inc. v. Vitalink Communications Corp., 34 U.S.P.Q.2d 1816, 1820 (Fed. Cir. 1995). In this case, the claimed invention is a CMP slurry directed towards use on ruthenium thin films or ruthenium alloy thin films.

In contrast, Avanzino is directed toward a CMP slurry for "circuit wafers having tungsten vias through silicon dioxide layers." See Avanzino at column 3, lines 51-52 and the abstract thereof. Thus, because Avanzino is directed toward a CMP slurry for tungsten with an option for additional ingredients directed toward polishing titanium (see column 8 at line 33), Avanzino cannot serve as an anticipating reference.

Second, and perhaps more importantly, independent claims 1 and 24 require "an oxidant consistent essentially of ceric ammonium nitrate" (claim 1) or "a single oxidant consisting essentially of ceric ammonium nitrate" (claim 24). By requiring the oxidant to consist essentially of ceric ammonium nitrate, applicants have limited the oxidant to only ceric ammonium nitrate and, perhaps, "unspecified ingredients

which do not materially affect the basic and novel characteristics of the oxidant." Ex Parte Hoffmann, 12 U.S.P.Q.2d 1061, 1063 (B.P.A.I. 1989). The terminology "consisting essentially of" excludes additional unspecified oxidants which would affect the basic and novel characteristics of the oxidants used in the claimed composition. In re Garnero, 162 U.S.P.Q. 221, 223 (C.C.P.A. 1969).

With the above concepts in mind, independent claims 1 and 24 are limited to a single oxidant consisting of essentially of ceric ammonium nitrate. In stark contrast, the primary embodiment disclosed in Avanzino is directed toward a tungsten oxidizer, again not directed toward a ruthenium thin film or a ruthenium alloy thin film, that may be selected from the group that does *not* include ceric ammonium nitrate. As a secondary embodiment, Avanzino discloses the use of an *additional* titanium polishing agents, which may include ceric ammonium nitrate. However, the titanium polishing agent disclosed in Avanzino would be used *in combination* with the tungsten oxidizing agent which, again, cannot be ceric ammonium nitrate.

Therefore, Avanzino in no way teaches or suggests a CMP slurry with a single oxidant that consists essentially of ceric ammonium nitrate (CAN).

Further, Avanzino discloses a CMP slurry having high tungsten and titanium polish rate. That is, the technical feature of the Avanzino patent is to provide the tungsten CMP slurry having high selectivity of TiN and Ti polish rate over dielectric polish rate. In order to provide the above tungsten CMP slurry, Avanzino uses not only a tungsten oxidizing agent but also a titanium oxidizing agent, such as CAN, but never without a tungsten oxidizing agent.

On the other hand, the claimed CMP slurry is applied to Ru and Ru alloy thin films which form a storage electrode. Avanzino does not teach that its CMP slurry can be used on Ru and Ru alloy thin films. Furthermore, since an appropriate CMP slurry is not available for polishing ruthenium and thus slurries for tungsten or aluminum are conventionally employed. In this case, the polishing speed of ruthenium is slow, and thus the CMP process is performed for a long time under a high polishing pressure. Therefore, scratches and impurities can be generated on the insulating film (see page 2, lines 15-19 of the specification).

Accordingly, there is no suggestion in Avanzino or the prior art that Ru or Ru alloy thin films can be polished using the tungsten slurry of Avanzino which relies upon a tungsten oxidizing agent, and only optionally, CAN.

Therefore, applicants respectfully submit that Avanzino does not teach or suggest the ruthenium thin film or ruthenium alloy thin film CMP slurries of independent claims 1 and 24 and therefore the anticipation rejection and obviousness rejections based upon Avanzino are improper and should be withdrawn.

Finally, claim 1 is further allowable over Avanzino because Avanzino does not teach or suggest the acids recited in claim 1. Further, for the reasons set forth below, applicants respectfully submit that no combination of Avanzino and Chopra renders claim 1 obvious as well.

With respect to the obviousness rejection of claims 4-5 and 9-13 under 35 U.S.C. § 103 as being unpatentable over Avanzino in view of U.S. Patent No. 6,419,554 ("Chopra"), applicants respectfully submit that this combination cannot support an obviousness rejection of either independent claim 1 or independent claim 24. Specifically, neither reference is directed toward a slurry for ruthenium alloy thin films or ruthenium thin films. Further, neither reference is directed toward a slurry having a single oxidant that consists essentially of ceric ammonium nitrate. While Chopra may disclose the acids recited in claim 1, no combination of Chopra and Avanzino teach or suggest the subject matter of claim 1 or claim 24 for the reasons set forth above.

Accordingly, applicants respectfully submit that the obviousness rejection based upon the hypothetical combination of Avanzino and Chopra is improper and should be withdrawn.

An early entry of this amendment and an indication of the allowability of this application is respectfully requested.

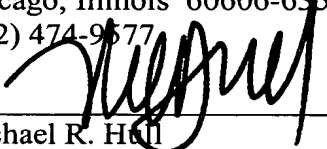
The Commissioner is authorized to charge any fee deficiency required by this paper, or credit any overpayment, to Deposit Account No. 13-2855.

Respectfully submitted,

MARSHALL, GERSTEIN & BORUN
6300 Sears Tower
233 South Wacker Drive
Chicago, Illinois 60606-6357
(312) 474-9577

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By:


Michael R. Hill
Reg. No. 35,902